



Bigelow Expandable Activity Module (BEAM)- ISS Inflatable Module Technology Demonstration

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Fig 1: BEAM Module on ISS-
Node 3 Aft

INNOVATION

BEAM is a pathway project demonstrating the design, fabrication, test, certification, integration, operation, on-orbit performance, and disposal of the first ever man-rated space inflatable structure. The groundwork laid through the BEAM project will support developing and launching a larger inflatable space structure with even greater mass per volume (M/V) advantages need for longer space missions.

OVERVIEW

Inflatable structures have been shown to have much lower mass per volume ratios (M/V) when compared with conventional space structures. BEAM is an expandable structure, launched in a packed state, and then expanded once on orbit. It is a temporary experimental module to be used for gathering structural, thermal, and radiation data while on orbit. BEAM will be launched on Space X-8, be extracted from the dragon trunk, and will attach to ISS at Node 3- Aft. BEAM performance will be monitored over a two-year period and then BEAM will be jettison using the SSRMS.

PROJECT OUTCOMES

Once on-orbit and inflated, ISS crew members will ingress into BEAM, retrieve deployment dynamic sensor hardware, and install a suite of instrumentation to monitor BEAM over the next two years. The crew will ingress three to four times to retrieve the performance data (temperature, pressure, mmoid impacts, and radiation). BEAM is groundbreaking in becoming the first man-rated inflatable space structure certified for flight.

INNOVATION

BEAM will demonstrate the feasibility and performance of a man-rated expandable space structure integrated onto ISS. BEAM will demonstrate the certification pathway and provide long-term performance insight required to develop and certify larger inflatable space structures that have superior mass to volume ratios (M/V).

Table 1: Mass to Volume (M/V) Comparison of
various Space Structures

ISS Module	Mass (kg)	Vol (m³)	M/V (kg/m³)	M/V Δ
TransHab	13200	340	39	-52%
BEAM	1300	16	81	-
Columbus	10300	95	108	+33%
Destiny	14520	106	137	+69%
Tranquility	13600	70	194	+140%
Zvezda (SM)	20295	89	228	+181%
Zarya (FGB)	20260	72	283	+249%

INFUSION

M/V efficient inflatable space structures can be utilized as an inflatable airlock, or large module required for long duration space missions.

PARTNERSHIPS

BEAM is funded by AES, ISS (Instrumentation and ISS Integration- NASA/Boeing) and Bigelow Aerospace. BEAM is launched by Space X (8) and the PCBM is procured from Sierra Nevada.

NASA TECHNOLOGY AREA ROADMAP

- TA 12.1.1 Lightweight Structure
- TA 12.2.1 Lightweight Concepts
- TA 12.2.5 Innovative Multifunctional Concepts
- TA12.3.1 Deployables, Docking and Interfaces

START TRL: 5 FINISH TRL: 9